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On Forward J/ψ Production at Fermilab Tevatron

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The DØ Collaboration has recently reported the measurement of J/ψ production at low angle. We show here that the inclusion of color octet contributions in any framework is able to reproduce this data.

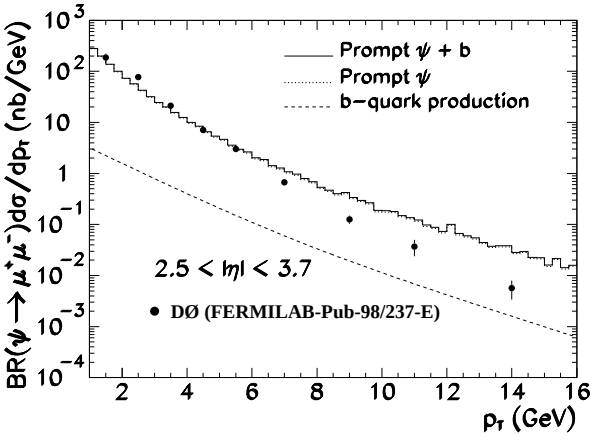

FIG. 1. The p_T dependence of the differential cross section

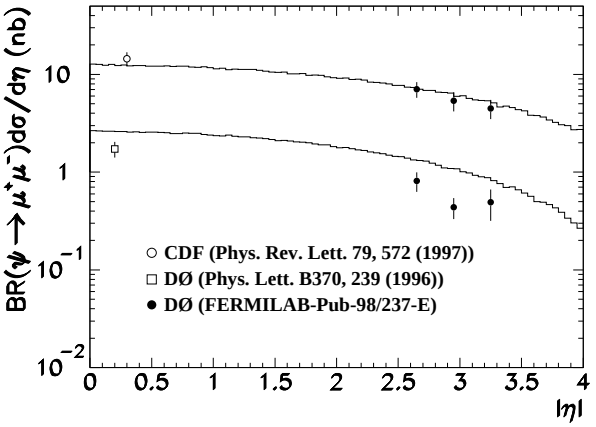

FIG. 2. The pseudorapidity dependence of the differential cross section

The DØ collaboration has recently reported the first measurement of J/ψ production in the forward pseudorapidity region $2.5 \leq |\eta| \leq 3.7$ in $p\bar{p}$ collisions at $\sqrt{s} = 1800$ GeV [1]. It was shown that the dependence of the J/ψ cross section with its transverse momentum confirmed theoretical expectations based on NRQCD [2]. Here we show that the soft color model [3] is also able to explain these results. The implication of this result is that this data, once more, requires the inclusion of color octet perturbative diagrams for the production of ψ's. How this is implemented is not decisive [3,4].

We have evaluated ψ production following reference [3]. Like the measurement, we included prompt production, as well as production via b-decay. We only adjusted the renormalization and factorization scales as appropriate for a leading order calculation. The predictions of the soft color model for the forward J/ψ production at the Tevatron is compared with the experimental results in Fig. 1. As can be seen, the leading order evaluation of the soft color model adequately describes the shape of the forward p_T distribution and its absolute normalization.

It is interesting to verify that the soft color model describes the rapidity distribution for different cuts on p_T. The result is shown in Fig. 2, and a good agreement is obtained.

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